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**MODEL 625**

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**AMBIENT ANALYSIS SYSTEM SETUP SOFTWARE - VERSION 1.6**

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**PURPOSE**

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The IED Model 540 Ambient Analysis System is adaptable to virtually any application requiring automatic adjustment of system levels to compensate for ambient noise or other sound sources. The Model 625 Software Package is provided to allow the installer or the user to optimize the capabilities of the Model 540 for the application. Since some of the parameters required to define system operation may not have been encountered previously, it is recommended that the first time user read through the function descriptions to gain some understanding of their meaning prior to attempting setup.

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**RECOMMENDED SETUP SEQUENCE**

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To achieve setup in the simplest way with a minimum of repetition, the following sequence is recommended:

1. From the CONFIGURE screen, set the Configuration (CONF), Sensor number (SN), Minimum Attenuation (MN), and Maximum Attenuation (MX). If uncertain, set MN to 0, and MX to 15 or 20.
2. From the Attack/Release screen, set Attack time (ATTACK), Release time (REL), and Scaling Constant (SCALE). Typical starting settings are ATTACK = 2.0, REL = 6.0, and SCALE = 1.0. All channels may be set simultaneously to the same values using the SET ALL function, or they may be set individually with the EDIT function.
3. From the Calibrate Channel screen, go through the system channel by channel performing the following three steps:
  - A. Calibrate the Feedback Constant (AUTO CAL function)
  - B. Set the Remote Threshold (RTH)
  - C. Fine tune the Feedback Constant

Further information about each of these parameters may be found under the descriptions of the respective functions in the FUNCTIONS section.

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**ACCESS**

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The Ambient Analysis Setup Software is accessed from the Password screen and menu. Use the **PASSWORD** function as described in the functions section, but enter the special setup password instead of the normal working password.



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## MENU TREE

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The Menu Tree is a diagram which includes all menus, and shows their interconnection. By examining the Menu Tree one may determine the path which must be followed to arrive at the desired function. The Functions section below includes a detailed description of each function, and how it operates.

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## SCREENS

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### General Description

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The screen images near the end of this document include all which may be encountered during operation of the system. Of course, the information displayed will vary with options selected, and the actual monitor screens are in color. A multi-level gray scale has been used to represent the actual screen colors.

The applicable function definitions describe most of what is found in the screen displays. Some information which is not found in the definitions is described below. The top line of the Main Screen displays the screen title, the version number (1.6), the port through which the computer will communicate, and the address and number of the rack (mainframe) for which data is being displayed. At the bottom of the screen is the Menu and Prompt area. All other screens include all of the foregoing information except for the version number. With the exception of the Calibrate Channel Screen, the central portion of the screens are devoted to tables of the appropriate function values. The Main and Emergency Screens include a status display (OK or FAULT) for the RS422 Link and the three power supplies located near the lower right corner of the screen. All other screens have a flashing indication of a Link Fault condition. It is located on the second line, just below the address (ADDR) display.

After changes have been made from any of the screens, upon exiting the prompt will remind the user to save the data, if it is desired to retain it. This prompt will appear only if there is no link fault. In the event that a link fault occurs, before proceeding further, the fault must first be cleared. The correct data for the current rack (mainframe) must then be read into the computer. This is accomplished by using the **GO TO RACK** function and entering the current rack number (the same one from which the fault was cleared).

### Main Screen

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The Main screen is a 'live' display of four system variables for all channels, the Input Signal (INP), the Remote Sensor (REM), the Combined Remote Sensors (CREM), and the Attenuator setting for each channel.

### Calibrate Channel Screen

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The Calibrate Channel screen display is unique, and warrants additional explanation. It provides real time, accurate analog and digital displays of four system variables of any

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channel. Refer to Figure 5. Each of the four analog bar graphs has an on-screen display range of 50 dB, although the total range is greater. The on-screen limits of each bar graph display may be adjusted by an offset. The offset value entered is the value which will appear at the extreme right end of the bar graph scale. Allowable offset values differ between the four displays. Centered above each bar graph is a fast digital display which provides a more precise reading of the variable, complete with sign.

Starting from the top, the first bar graph represents the Channel Input (audio signal) level in dBv. Its allowable offset values are -10, 0, 10, and 20. The second display is the Remote Sensor level (SPL) in dBv. This is the sensed ambient signal level (which may include some contribution from the outgoing audio). Its allowable offset values are 100, 110, and 120. Figure 1 below is the frequency response curve of the sensors for the two bar graphs described above. It is not the response of the input channel audio signal path which is flat and wide-band. See Section 9.25A for details.

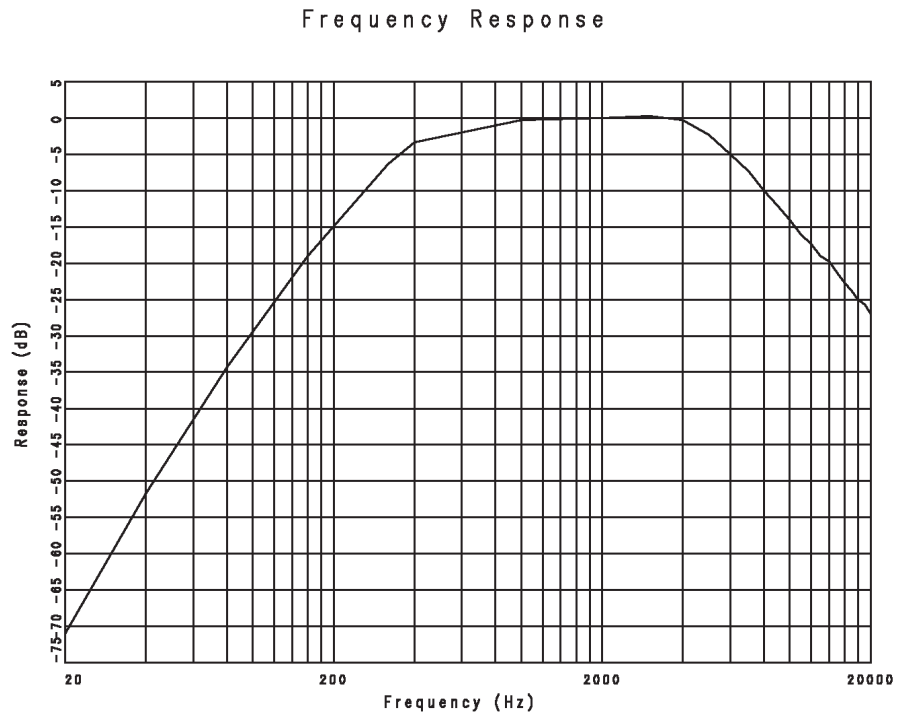


Figure 1 - Frequency response of the sensors for the Channel Input Level bar graph display and the Remote Sensor bar graph display

The third bar graph from the top is the Computed Attenuation, and the bottom Bar graph is the Channel Attenuation. Refer to the EDIT WINDOW function for their definitions. Both have permissible offsets of 0, 10, 20, 30, or 40.



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## FUNCTIONS

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### PASSWORD

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**Description:** A password is used for security reasons. It prevents unauthorized persons from making changes in the system configuration. The **PASSWORD** function is used to enter the other function menus which allow system modifications, modification of the operating parameters, scheduling, and testing.

**Key sequence:** When the function key is pressed, the prompt "ENTER PASSWORD" appears. Type in the password, then press ENTER. Take care to type correctly. For security reasons, the characters will not appear on the screen. Once the password has been entered properly, the next menu appears.

**Error messages:** None. Computer beeps if an incorrect entry is made.

### SET ATTN (SET ATTENUATOR)

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**Description:** The **SET ATTN** function is provided to allow setting fixed attenuators. This includes all Emergency channels as well as normal channels designated as fixed.

**Key sequence:** When the function key is pressed, the menu is replaced by the prompt which states: "Use Arrow keys, 'Home' and 'End' keys to move cursor. Hit 'Enter' when finished". The cursor, a green rectangle, appears in the 'ATTN' (attenuator) column of the last channel position in which it was left, unless the computer has been turned off or reset. In that case, the cursor will be found at the ATTN column of channel 1. The setting at the cursor position may be changed by entering a new value. The range of allowable settings is 0 - 85 dB in 1/3 dB steps. The entry will automatically be rounded to the nearest 1/3 dB (XX.0, XX.3, or XX.7).

Move the cursor between ATTN columns with the Left and Right arrow keys and between rows with the Up and Down arrow keys. The Home key moves the cursor to channel 1, and the End key moves it to channel 44. All current settings will be displayed. Variable readings will be frozen during the setting procedure. When a new entry is begun, the previous setting will disappear. It is not necessary to enter zeroes to the right of the decimal point. They will be entered automatically. Continue moving the cursor to each desired channel and entering the new values until all desired entries have been made, then press the ENTER key.

**Error messages:** None. If a value greater than 85 is entered, when an attempt is made to move the cursor, or when ENTER is pressed, the computer will beep, the cursor will remain in the same position, and the previous setting will return. If an attempt is made to enter any character other than 0 - 9, the computer will beep and the entry will be rejected.

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## CONFIGURE

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**Description:** The **CONFIGURE** function is used to access the configuration screen and menu.

**Key sequence:** When the function key is pressed, the configuration screen and menu appear immediately. No further action is necessary.

**Error messages:** None.

## EDIT CONFIG (EDIT CONFIGURATION)

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**Description:** The **EDIT CONFIG** function is provided to permit setting the values in the channel configuration table which occupies most of the configuration screen. Following the channel number column (CH), each channel has 5 values which can be set. They are configuration (CONF), minimum attenuation (MN), maximum attenuation (MX), remote threshold (RTH), and feedback constant (FBC). The last column, sensor (SN), together with the CH column is used to define the control of channel(s) by one or more sensors. The number in the SN column is the channel which is controlled by the sensor connected to the channel in the CH column. A more detailed explanation of column entries is given below.

There are 3 possible configurations which may be entered in the CONF column. They are FIXD (fixed gain or attenuation), AUTO (automatic noise tracking based on one or more sensors) and C XX (controlled by or slaved to channel number XX). When entering the configuration, it is not necessary to type the entire abbreviation. Letter entries may be upper or lower case. To specify a channel as fixed, with the cursor in the CONF column for the desired channel, type F, then move the cursor to another channel. FIXD will appear in the CONF column for that channel. For automatic operation, proceed as above, but type A. For controlled operation, type C and the number of the controlling channel (for example, C7 or C32).

The MN and MX columns have no effect on fixed channels. They apply only to auto or controlled channels. They define the limits of the range over which the attenuation may swing. To enter the values, move the cursor to the desired channel and the appropriate column, then type the desired value. The MX value must be greater than the MN value. Moving the cursor to another column or channel will enter the value.

The remote threshold (RTH) is the level of the remote sensor (see calibrate channel screen) above which the system begins to increase channel attenuation. See **SET RETH** for further discussion.

The feedback constant (FBC) is the correction factor which allows the system to compensate for program signal which is detected by the sensor(s) in combination with the ambient noise. Although the FBC may be entered or modified from this menu, the initial value must be determined using the **AUTO CAL** function found in the Calibrate Channel screen and menu.



**Error messages:** None. If a character other than those permitted for the entry or outside the range of the entry is attempted, the computer will beep, and the entry will be rejected.

## **EDIT WINDOW (EDIT ATTACK WINDOW AND RELEASE LIMIT)**

**Description:** The **EDIT WINDOW** function is used to enter values for the Attack Window and the Release Limit, two constants used in determining the Channel Attenuation. These constants should not be confused with the attack and release times which are time constants used to describe how rapidly the level changes. In this case, a time constant is the time required for the Channel Attenuation to reach approximately 63% of its final value in response to a step change in the Computed Attenuation.

The Computed Attenuation changes almost instantaneously in response to ambient noise changes. The 540 smoothes the changes in the Computed Attenuation by applying the attack and/or release time constants. The result is the Channel Attenuation which is the attenuation actually used to adjust the program level.

The terms Attack Time Constant and Release Time Constant in this application have meanings which differ from the classic definitions. The Release Time Constant, usually set to a relatively long time, applies to all normal changes in noise level (both increases and decreases) and causes the system to respond gradually to them. The Attack Time Constant, usually set to a much shorter time, is only used when there is a sudden large increase in ambient noise. The parameter on which the system bases the decision to switch from the Release Time Constant to the Attack Time Constant is the Attack Window. That is, when the Channel Attenuation minus the Computed Attenuation exceeds the Attack Window, the 540 uses the Attack Time Constant to determine Channel Attenuation. This allows the system to increase level more rapidly in response to a sudden increase in ambient noise. Typically, the Attack Window is set to 6 dB. If the Attack Window is increased, a larger sudden increase in ambient noise will be required for the system to switch to the attack time constant and increase the sound level quickly. Decreasing the Attack Window will cause the level to respond quickly to smaller peaks. If the Attack Window is made 0, the system will tend to 'ride the peaks', since it will respond quickly to every peak, but decay slowly.

Another parameter, the Release Limit, prevents the channel gain from dropping too rapidly in response to a momentary drop in noise, thereby smoothing system operation. The Release Limit is used to limit the value of instantaneous decrease of ambient noise, in dB, that the 540 will use when determining Channel Attenuation (it does not limit the attenuation, only the value used in the calculation by the system). Typically, the Release Limit is set to 12 dB to provide smooth operation in situations where ambient noise or program level change rapidly. If the Release Limit is increased, the system will use a larger number when calculating attenuation during decreases in noise, and will therefore decrease sound level by a greater amount in response to momentary drops in noise. The result will be greater fluctuations in sound level due to changes in noise. The smaller the value of the Release Limit, the more slowly it will respond to decreases in noise.

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**Key sequence:** When the function key is pressed, the prompt requests that the new value for the Attack Window be entered. Type the desired value, in dB, then press ENTER. The prompt will now request the new value for the release limit. Values from 0 to 127 may be entered for each constant. Once the new value has been typed in and ENTER has been pressed, the function is complete.

**Error messages:** If an attempt is made to enter a value greater than 127, the message "Error, enter a number from 0 to 127" appears. Characters other than 0 - 9 may result in erroneous entries.

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## LOAD FILE

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**Description:** The **LOAD FILE** function is provided for the purpose of downloading the configuration data from the non-volatile memory of the 590 microcomputer to the 540.

**Key sequence:** When the function key is pressed, the data file is automatically downloaded from the non-volatile memory of the 590 microcomputer and is displayed on the screen. No further action is necessary.

**Error messages:** None.

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## SAVE FILE

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**Description:** The **SAVE FILE** function is provided to copy the configuration data for the 540 rack which is currently selected and displayed to the non-volatile memory of the 590 microcomputer so that it may be retained indefinitely.

**Key sequence:** When the function key is pressed, the data in computer memory is automatically copied to non-volatile memory. No further action is necessary.

**Error messages:** None.

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## NEXT RACK

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**Description:** The **NEXT RACK** function is provided as one means of choosing the rack (mainframe) whose data is selected and displayed on the screen. A rack must be selected and displayed in order to set up its operating parameters and observe its performance.

**Key sequence:** When the function key is pressed, the number of the selected rack advances by 1 and the screen display changes accordingly. When the last rack is reached, pressing the function key again returns the display to rack number 1.

**Error messages:** None.



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## GO TO RACK (SELECT AND DISPLAY RACK)

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**Description:** The **GO TO RACK** function is provided as a means of selecting any rack to be displayed without sequencing through all the racks.

**Key sequence:** When the function key is pressed, the prompt requests "Enter new rack number: ". Type the number of the desired rack, then press ENTER. The parameters for the selected rack will be displayed immediately.

**Error messages:** If an out of range rack number is requested, or if a character other than 1 - X is entered, the following message will appear: "Error, enter a number from 1 to X", where X is the number of racks entered with the **TOTAL RACKS** function.

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## PRNT CONFIG (PRINT CONFIGURATION DATA)

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**Description:** The **PRNT CONFIG** function is used to obtain a printout of all parameters of all channels of the selected rack. In order for the printout to occur, a printer must be connected to the printer port of the 590 microcomputer, the printer must be connected to the AC line, the power switch must be ON, the printer must be on line, and it must be loaded with paper.

**Key sequence:** When the function key is pressed, the printout will begin within a few seconds provided all the conditions mentioned above are met.

**Error messages:** None.

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## MAIN MENU

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**Description:** The **MAIN MENU** function is used to leave the current screen and menu and return to the main screen and menu.

**Key sequence:** When the function key is pressed, the current menu and screen will be exited immediately, and it will be replaced by the main screen and menu.

**Error messages:** None.

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## ATCK/REL (ATTACK AND RELEASE TIMES)

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**Description:** The **ATCK/REL** function is used to access the ATTACK/RELEASE screen and menu.

**Key sequence:** When the function key is pressed, the ATTACK/RELEASE screen and menu appear immediately. No further action is necessary.

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**Error messages:** None.

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## EDIT

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**Description:** The **EDIT** function is provided to permit changing the Attack Time, the Release Time, or the Scaling Constant for any or all channels.

**Key sequence:** The cursor, a green rectangle, appears in the position in which it was last left, unless the computer has been turned off or reset. In that case, the cursor will be found at the ATTACK column of channel 1. The cursor control keys are the four arrow keys, the Home and End keys, and the Tab key (on some keyboards the Tab key is labelled only with the “ $\infty$ ” symbol). The Left and Right arrow keys move the cursor within a row. The Up and Down arrow keys move it within a column. The Home key moves the cursor to row 1, column 1, and the End key moves it to the last column of the last row. The Tab key will move the cursor sequentially through the entire table. Only the entry at the cursor position may be changed.

When a new entry is begun in a position, the previous value will disappear. While entering a value, before leaving the position, corrections may be made using the backspace key to erase. Valid values for the attack and release times are 1.0 - 18900 seconds (315 minutes or 5.25 hours). Valid values for the scaling factor are 1.0 - 3.0. Because of the nature of the computation, when very large values of attack time or release time are entered, the value which appears in the table will not be exactly as entered.

Use the cursor control keys to move to all desired positions, make the changes, then press the ENTER key to exit the function.

**Error messages:** None. If an out of range value or a character other than 0 - 9 is entered, the entry will be rejected, and the previous entry will return.

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## SET ALL (SET ALL TABLE VALUES)

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**Description:** The **SET ALL** function is provided to simplify setting table values for Attack Time, Release Time, and Scaling Constant, when each of the three values is to be the same for all or most channels. It is also a convenient way of setting all channels to a nominal starting point for initial system setup.

**Key sequence:** When the function key is pressed, the prompt requests: “Enter new Attack Time for all channels: ”. Type the new value, then press ENTER, or press ENTER without typing a value to bypass this entry. A new prompt will appear requesting: “Enter new Release Time for all channels: ”. Type the new value, then press ENTER, or press ENTER without typing a value to bypass this entry. A third prompt will appear requesting: “Enter new Scaling Constant for all channels: ”. Type the new value, then press ENTER, or press ENTER without typing a value to bypass this entry. The new values will now appear in their proper screen positions. The range of numbers which may be en-



tered for Attack Time or Release Time is 1.0 to 18900, and 1.0 to 3.0 for the Scaling Constant.

**Error messages:** If an out of range number or a character other than 0 - 9 is entered for Attack or Release Times, the entry will be rejected and the following message will appear: "Error, Enter a number from 1.0 to 18900". If an out of range number or a character other than 0 - 9 is entered for the Scaling Constant, the entry will be rejected and the following message will appear: "Error, Enter a number from 1.0 to 3.0".

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## CALIBRATE

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**Description:** The **CALIBRATE** function is used to access the CALIBRATE CHANNEL screen and menu.

**Key sequence:** When the function key is pressed, the CALIBRATE CHANNEL screen and menu appear immediately. No further action is necessary.

**Error messages:** None.

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## CHG CHAN # (CHANGE CHANNEL NUMBER)

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**Description:** The **CHG CHAN #** function is used to select the channel whose data is to be displayed and set up.

**Key sequence:** When the function key is pressed, the prompt "Enter new Channel Number " appears. Type the number of the desired channel, then press ENTER. Its levels will be displayed dynamically on the screen, with the channel number, and configuration data below.

**Error messages:** If a channel number outside the range of 1 - 44, or a character other than 0 - 9 is entered the following message will appear: "Error, Enter a number from 1 to 44".

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## SET OFFSET

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**Description:** The **SET OFFSET** function is used to adjust the dynamic displays so that the variables remain within the range of the display. The values entered will represent the right hand edge of each of the four displays.

**Key sequence:** When the function key is pressed, a prompt will request "Enter new Offset for CHANNEL INPUT LEVEL (dBv): ". Type the desired value, then press ENTER, or press ENTER without typing a value for no change. Valid offset values which may be entered are -10, 0, 10, 20. A second prompt will request "Enter new Offset for REMOTE SENSOR LEVEL (SPL): ". Type the desired value, then press ENTER, or press ENTER

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without typing a value for no change. Valid offset values which may be entered are 100, 110, and 120. A third prompt will request "Enter new Offset for COMPUTED ATTENUATION (dB): ". Type the desired value, then press ENTER, or press ENTER without typing a value for no change. Valid offset values which may be entered are 0, 10, 20, 30, or 40. A fourth prompt will request "Enter new Offset for CHANNEL ATTENUATION (dB): ". Type the desired value, then press ENTER, or press ENTER without typing a value for no change. Valid offset values which may be entered are 0, 10, 20, 30, or 40.

**Error messages:** If any entry other than the specific valid values listed above is made, the entry will be rejected and a message will appear indicating the values which may be entered.

## CHG CONFIG (CHANGE CONFIGURATION)

**Description:** The **CHG CONFIG** function allows changing the configuration of the channel being displayed. There are three choices. They are FIXD (fixed gain or attenuation), AUTO (automatic noise tracking based on one or more sensors) and C XX (controlled by or slaved to channel number XX).

**Key sequence:** When the function key is pressed, the prompt requests "Enter Controlling Channel Number, F(ixed), or A(uto): ". Letter entries may be upper or lower case. To specify a channel as fixed, type F, then press ENTER. FIXD will appear in the CONFIGURATION block. For automatic operation, proceed as above, but type A. AUTO will appear. For controlled operation, type only the number of the controlling channel. C and the number of the controlling channel will appear.

**Error messages:** If an entry other than 1 to 44, F, or A is made, the following message will appear: "Error, enter a number from 1 to 44, F or A".

## SET SCALING (SET SCALING CONSTANT)

**Description:** The **SET SCALING** function is provided to allow setting the scaling constant for the channel being displayed. The scaling constant is the ratio of the change in noise level to the resultant change in program level. For example, with a scaling factor of 2, if the ambient noise increases by 2 dB, the program level would be increased (attenuation decreased) by 1 dB. The scaling constant may have a value between 1.0 and 3.0.

**Key sequence:** When the function key is pressed, the prompt requests "Enter Scaling Constant: ". Type the desired value, then press ENTER. The new value appears immediately in the SCALING CON box just above the menu.

**Error messages:** If a character other than 0 - 9 or a value outside the range of 1.0 to 3.0 is entered, the following message will appear: "Error, enter a number from 1.0 to 3.0".



### **SET MIN ATN (SET MINIMUM ATTENUATION)**

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**Description:** The **SET MIN ATN** function is provided to set the minimum attenuation of an AUTO or CONTROLLED channel. The allowable range is 0 to 85 dB.

>> **Note: The Minimum Attenuation must be set before setting other Auto or Controlled channel settings.**

**Key sequence:** When the function key is pressed, the prompt requests: "Enter Minimum Attenuation: ". Type the desired value, then press ENTER. The new value will appear immediately in the MIN ATN box above the menu.

**Error messages:** If a value outside the allowable range is entered, or a character other than 0 - 9, the following message will appear: "Error, enter a number from 0 to 85".

### **SET MAX ATN (SET MAXIMUM ATTENUATION)**

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**Description:** The **SET MAX ATN** function is provided to set the maximum attenuation of an AUTO or CONTROLLED channel. The allowable range is 0 to 85 dB.

>> **Note: The Maximum Attenuation must be set before setting other Auto or Controlled channel settings. The Maximum Attenuation must be set greater than the Minimum Attenuation.**

**Key sequence:** When the function key is pressed, the prompt requests: "Enter Maximum Attenuation: ". Type the desired value, then press ENTER. The new value will appear immediately in the MAX ATN box above the menu.

**Error messages:** If a value outside the allowable range is entered, or a character other than 0 - 9, the following message will appear: "Error, enter a number from 0 to 85".

### **SET REM TH (SET REMOTE THRESHOLD)**

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**Description:** For a channel in the automatic mode, the **SET REM TH** function is provided to allow setting the Remote Threshold (RTH) to the desired value. The RTH is the Remote Sensor Level at which the system begins to increase sound level (decrease attenuation) to compensate for ambient noise. The RTH also appears under the **EDIT CONFIG** function.

Remote threshold should be set with no program signal, and using the noise which will actually be encountered. When the noise just reaches the level at which it is desired to begin increasing the program level, read the remote sensor level from its bar graph display and enter this value as the remote threshold.

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For a channel in the controlled mode the REMOTE THRESHOLD box above the menu is replaced by a box labelled ATTENUATION OFFSET. The Attenuation Offset is the amount by which the attenuation of a controlled channel is offset from the attenuation of its controlling channel. Its value may be positive or negative. The attenuation offset added algebraically (taking the signs into account) to the controlling channel attenuation equals the attenuation of the controlled channel, until the controlled channel attenuation reaches either its maximum or minimum attenuation.

A controlling channel is a channel in the Automatic mode (AUTO). It receives ambient

### ATTENUATION OFFSET EXAMPLES

Example 1. Controlling Channel Attenuation: Min = 0 dB Max = 20 dB  
 Controlled Channel Attenuation: Min = 0 dB Max = 20 dB  
 Offset = 0 dB

With Offset = 0 and Min/Max limits of both channels the same, the Controlled Channel will track the Controlling Channel for all values of Controlling Channel attenuation.

If Controlling Channel Attenuation = 0 dB, Controlled Channel = 0 dB  
 If Controlling Channel Attenuation = 10 dB, Controlled Channel = 10 dB  
 If Controlling Channel Attenuation = 20 dB, Controlled Channel = 20 dB

Example 2. Controlling Channel Attenuation Min = 0 dB Max = 20 dB  
 Controlled Channel Attenuation Min = 5 dB Max = 15 dB

The Controlled Channel Attenuation will equal the Controlling Channel Attenuation plus the Offset, as long as the Controlled Channel Attenuation does not exceed its Min/Max limits.

If Controlling Channel Attenuation = 0 dB  
 Offset = +5 dB  
 Controlled Channel Attenuation = 5 dB (0 + 5 = 5)

If Controlling Channel Attenuation = 10 dB  
 Offset = -5  
 Controlled Channel Attenuation = 5 dB (10 - 5 = 5)

If Controlling Channel Attenuation = 20 dB  
 Offset = +5  
 Controlled Channel Attenuation = 15 dB (20 + 5 = 25, but Max limit for the Controlled Channel = 15 dB, and Controlled Channel Attenuation cannot exceed its Max limit)

level information from one or more sensors and responds to that information in accordance with the parameters which have been set up for it. A controlled channel is a channel in the Controlled mode (C X, where X is the number of the Controlling channel). It does not receive sensor information. Instead, it is slaved to, and tracks, a Controlling (Automatic) channel, taking into account its own Min/Max limits and offset. See the example below.

The attenuation offset is entered using the **SET REM TH** function key.

For a channel in the fixed mode, the **SET REM TH** function key has no useful purpose.



**Key sequence:** For a channel in the automatic mode, when the function key is pressed, the prompt requests: "Enter remote threshold: ". Type the desired value, then press ENTER. The new value will appear immediately in the REMOTE THRESHOLD box above the menu. Permissible values are 50 to 135.

For a channel in the controlled mode, when the function key is pressed, the prompt requests: "Enter attenuation offset: ". Type the desired value, then press ENTER. The new value will appear immediately in the ATTENUATION OFFSET box above the menu. Permissible values are -85 to +85.

Changing the configuration causes the Remote Threshold/Attenuation Offset to be re-computed and may result in unusual values to appear on the screen. This function should be set after the configuration has been selected.

**Error messages:** For a remote threshold entry, if a number outside the permissible range is entered, the message "Error, enter a number from 50 to 135" will appear.

For an attenuation offset entry, if a number outside the permissible range is entered, the message "Error, enter a number from -85 to +85" will appear.

Characters other than 0 - 9 and "-" or "+" will be rejected and can cause an erroneous entry.

## **SET FB CON (SET FEEDBACK CONSTANT)**

**Description:** The **SET FB CON** function is provided to permit making minor corrections to the feedback constant for the channel being displayed. The value is best determined using the **AUTO CAL** function. If done properly, the value obtained will be optimum. To check operation, operate the channel with no program, but with a noise level which gives an attenuation reading approximately half way between minimum and maximum. A pink noise source introduced through a loudspeaker placed in the vicinity of the remote sensor may be used. Using a source of constant program (no long pauses), add in the program and observe the attenuation. It should remain constant, or at worst, decrease slightly. If the attenuation decreases (program level turns up), decrease the value of the feedback constant. If the attenuation increases more than a small amount (program level turns down), increase the value of the feedback constant.

**Key sequence:** When the function key is pressed, the prompt requests: "Enter Feedback Constant ". Type the desired value, then press ENTER. The new value will appear immediately in the FEEDBACK CON box above the menu. Permissible values are -85 to +85.

**Error messages:** If a number outside the permissible range is entered, the message "Error, enter a number from -85 to +85" will appear. Characters other than 0 - 9 and "-" or "+" will be rejected and can cause an erroneous entry.

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## **AUTO CAL (AUTOMATIC CALIBRATION OF FEEDBACK CONSTANT)**

---

**Description:** The **AUTO CAL** function is provided for automatic determination of the feedback constant. It is recommended that the initial value be determined using this function. The value may be fine-tuned afterward using **EDIT CONFIG** or **SET FB CON**.

To use this function it is first necessary to introduce a signal from an external source into the channel being calibrated. Either pink noise or program may be utilized. If program is used, it must be continuous (no pauses longer than about 1/2 second). The signal must be routed only to the channel being calibrated, and it must be at normal operating levels.

**Key sequence:** When the function key is pressed, the following warning message appears: "WARNING: Auto Calibration will set the channel to minimum Attenuation. Continue (Y/N) ". Type Y to proceed, or any other key to terminate the function. If Y is entered, the calibration proceeds immediately. The calibration takes 12 seconds. During the calibration the following message appears on the screen: "Calibration under way, hit any key to stop". Note that interrupting the calibration before it completes automatically may result in an invalid calibration.

**Error messages:** None.

## **FIND ADDR (FIND RACK ADDRESS)**

---

**Description:** The **FIND ADDR** function is used to access the FIND RACK ADDRESS screen and menu.

**Key sequence:** When the function key is pressed, the FIND RACK ADDRESS screen and menu appear immediately. No further action is necessary.

**Error messages:** None.

## **FIND ONE (FIND THE ADDRESS OF ONE RACK)**

---

**Description:** The **FIND ONE** function may be used only when there is just one 540 mainframe (rack) in the system. It will read the address of the rack and load it into the 590 microcomputer memory, making the screen display correct.

**Key sequence:** When the function key is pressed, the address is read and stored, and the screen display is updated immediately.

**Error messages:** If no racks are connected, or if more than one rack is connected, the following message will appear: "Rack not found or multiple racks responding!".



---

## **FIND ALL (FIND ALL RACK ADDRESSES)**

---

**Description:** The **FIND ALL** function is provided to simplify the setup procedure by displaying all addresses at which 540 mainframes (racks) are located. All addresses are interrogated, and those at which racks are located are highlighted. The address of the currently selected rack is displayed in yellow. Other occupied addresses will be displayed in green. If a rack is not found at the address at which the currently selected rack is supposed to be located, that address is displayed in red.

**Key sequence:** When the function key is pressed, the search begins immediately and proceeds rapidly. It may be terminated before completion by striking any key.

**Error messages:** None.

---

## **CHG PORT (CHANGE PORT)**

---

**Description:** The **CHG PORT** function is provided to set or change the RS422 port through which the 540 communicates. Valid numbers are 0 - 15.

**Key sequence:** When the function key is pressed, the prompt will request "Enter the new port number: ". Type the desired number from 0 - 15, then press ENTER.

**Error messages:** If an attempt is made to enter a number larger than 15, the message "Error, enter a number from 0 to 15" will appear. Characters other than 0 - 9 are rejected.

---

## **CHG ADDRESS (CHANGE ADDRESS)**

---

**Description:** The **CHG ADDRESS** function is used to set or change the address of each 540 mainframe (rack) in the system. Valid addresses are 0 - 255.

**Key sequence:** When the function key is pressed, the prompt requests "Enter new rack address: ". Type the desired address between 0 and 255, then press ENTER. The new address is immediately entered in the address box at the top of the screen.

**Error messages:** If an address outside the range of 0 - 255 is entered, the message "Error, enter a number between 0 and 255" appears. Entry of characters other than 0 - 9 will result in an erroneous address.

---

## **SET ADDRESS (SET RACK ADDRESS)**

---

**Description:** The **SET ADDRESS** function is provided to set the address of the currently selected mainframe (rack). This is the address stored in the rack itself at which it will respond to communication. It also saves the address in non-volatile memory of the 590 microcomputer and loads it into the 540 mainframe (rack).

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**Key sequence:** When the function key is pressed, the prompt requests: "Enter new rack address: ". Type the desired address, then press ENTER. Acceptable value are 0 - 255.

**Error messages:** An out of range entry will result in the message "Error, enter a number from 0 - 255". Entry of characters other than 0 - 9 will produce erroneous addresses.

### **FLASH BUSY (FLASH BUSY INDICATOR)**

---

**Description:** The **FLASH BUSY** function is provided to assist in identifying the physical mainframe (rack) which corresponds to the currently selected rack displayed on the screen. The function causes the busy indicator on the 540 CPU to flash.

**Key sequence:** When the function key is pressed, the busy indicator on the 540 CPU card of the currently selected rack will begin to flash. It will continue to flash until any key is struck. The prompt indicates "Hit any key to stop".

**Error messages:** None.

### **TOTAL RACKS (TOTAL NUMBER OF RACKS)**

---

**Description:** The **TOTAL RACKS** function is used to set the number of racks (mainframes) in the system into the data file for use by the 590 microcomputer.

**Key sequence:** When the function key is pressed, the prompt states "Total Number of Racks is now X. Enter New Total (1 - 7):", where X is the current total value stored in the data file. Type the number of 540 mainframes in the system, then press ENTER. The new total will then be saved in the data file.

**Error messages:** Entry of any character other than 1 - 7 will cause the message "Error, enter a number from 1 - 7" to appear.

### **EMERGENCY (EMERGENCY MODE)**

---

**Description:** The **EMERGENCY** function is a toggle which switches the setup software in and out of the Emergency mode. When in the Emergency mode, all channels are operated in the fixed gain configuration.

**>> Note: If left in the Emergency mode and saved when exiting, it will remain in the Emergency mode with the gain turned up and fixed until an emergency announcement is made. It is recommended that the system be toggled out of the Emergency mode before exiting to avoid this problem.**

**Key sequence:** Each time the function key is pressed, the mode will change. If the software has been in the Normal mode, it will switch to the Emergency mode. If it has been



in the Emergency mode, it will switch into the Normal mode. When in the Emergency mode, the ATTN (attenuator) settings will be displayed in red. Use the **SET ATTN** function to set all emergency channels to be used to the desired values.

**Error messages:** None.

---

## EXIT

---

**Description:** The **EXIT** function is used to leave the 540 setup program and return to the PASSWORD level menu.

**Key sequence:** When the function key is pressed, the prompt will ask "Are you sure you want to Exit (Y or N)?" Type Y to continue the exit process, or any other key to cancel the **EXIT** function and return to the MAIN menu and screen. If "Y" was entered and changes have been made, a second prompt will now state "Current configuration has not been saved, Do you want to save configuration (Y or N)?" Type Y to save, or any other key to bypass.

**Error messages:** None.

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```

IED 540 Ambient Analysis System - V1.6      PORT: 0 (2C1)  ADDR: 1  RACK: 1
  CH  INP  REM  CREM  ATTN  CH  INP  REM  CREM  ATTN  CH  INP  REM  CREM  ATTN
  1  -18  70  71  15.0  17  -56  50  50  0.0  33  -56  50  50  0.0
  2  -18  62  62  20.0  18  -56  50  50  0.0  34  -56  50  50  0.0
  3  -17  62  50  15.0  19  -56  50  50  0.0  35  -56  50  50  0.0
  4  -17  62  50  10.0  20  -56  50  50  0.0  36  -56  50  50  0.0

  5  -56  50  50  15.0  21  -56  50  50  0.0  37  -56  50  50  0.0
  6  -56  50  50  15.0  22  -56  50  50  0.0  38  -56  50  50  0.0
  7  -56  50  50  0.0   23  -56  50  50  0.0  39  -56  50  50  0.0
  8  -56  50  50  6.0   24  -56  50  50  0.0  40  -56  50  50  0.0

  9  -56  50  50  15.0  25  -56  50  50  0.0  41  -56  50  50  0.0
 10  -56  50  50  15.0  26  -56  50  50  0.0  42  -56  50  50  0.0
 11  -56  50  50  15.0  27  -56  50  50  0.0  43  -56  50  50  0.0
 12  -56  50  50  15.0  28  -56  50  50  0.0  44  -56  50  50  0.0

 13  -56  50  50  15.0  29  -56  50  50  0.0
 14  -56  50  50  20.0  30  -56  50  50  0.0
 15  -56  50  50  25.0  31  -56  50  50  0.0
 16  -56  50  50  15.0  32  -56  50  50  0.0

                                LINK OK
                                +30v OK
                                +15v OK
                                -15v OK

  F1: Set Attn  F3: Atck/Rel  F5: Find Addr  F7: Next Rack  F9: Emergency
  F2: Configure F4: Calibrate F6:           F8: Go to Rack F10: Exit
    
```

Figure 3 - Main screen

```

View/Edit Configuration      PORT: 0 (2C1)  ADDR: 1  RACK: 1
                                LINK FAULT
  CH  CONF  MN  MX  RTH  FBC  SN  CH  CONF  MN  MX  RTH  FBC  SN  CH  CONF  MN  MX  RTH  FBC  SN
  1  AUTO  0  20  65  17  1  17  FIXD  0  85  0  0  NU  33  FIXD  0  85  0  0  NU
  2  AUTO  5  20  70  12  2  18  FIXD  0  85  0  0  NU  34  FIXD  0  85  0  0  NU
  3  C  1  0  15  5  0  2  19  FIXD  0  85  0  0  NU  35  FIXD  0  85  0  0  NU
  4  C  1  0  15  -5  5  2  20  FIXD  0  85  0  0  NU  36  FIXD  0  85  0  0  NU

  5  AUTO  0  15  80  -2  6  21  FIXD  0  85  0  0  NU  37  FIXD  0  85  0  0  NU
  6  AUTO  0  15  75  5  5  22  FIXD  0  85  0  0  NU  38  FIXD  0  85  0  0  NU
  7  FIXD  0  15  0  0  12  23  FIXD  0  85  0  0  NU  39  FIXD  0  85  0  0  NU
  8  FIXD  0  15  0  0  12  24  FIXD  0  85  0  0  NU  40  FIXD  0  85  0  0  NU

  9  C  12  0  15  0  0  12  25  FIXD  0  85  0  0  NU  41  FIXD  0  85  0  0  NU
 10  C  12  0  15  0  0  12  26  FIXD  0  85  0  0  NU  42  FIXD  0  85  0  0  NU
 11  C  12  0  15  0  0  12  27  FIXD  0  85  0  0  NU  43  FIXD  0  85  0  0  NU
 12  AUTO  0  15  72  8  12  28  FIXD  0  85  0  0  NU  44  FIXD  0  85  0  0  NU

 13  C  12  0  20  0  0  NU  29  FIXD  0  85  0  0  NU
 14  C  12  0  25  5  0  NU  30  FIXD  0  85  0  0  NU
 15  C  12  0  30  10  0  NU  31  FIXD  0  85  0  0  NU
 16  C  12  0  30  0  0  NU  32  FIXD  0  85  0  0  NU

                                Attack Window: 6
                                Release Limit: 12

  F1: Edit Config F3:           F5: Load File  F7: Next Rack  F9: Prnt Config
  F2: Edit Window F4:           F6: Save File  F8: Go to Rack F10: Main Menu
    
```

Figure 4 - Configure screen  
 showing link fault indicator

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View/Edit Attack/Release Times      PORT: 0 (2C1)    ADDR: 1    RACK: 1

CH	ATTACK	REL	SCALE	CH	ATTACK	REL	SCALE	CH	ATTACK	REL	SCALE
1	2.0	4.0	1.0	17	1.5	3.0	1.0	33	1.5	3.0	1.0
2	1.0	2.0	1.0	18	1.5	3.0	1.0	34	1.5	3.0	1.0
3	1.5	3.0	1.0	19	1.5	3.0	1.0	35	1.5	3.0	1.0
4	1.5	3.0	1.0	20	1.5	3.0	1.0	36	1.5	3.0	1.0
5	1.5	3.0	1.0	21	1.5	3.0	1.0	37	1.5	3.0	1.0
6	1.5	3.0	1.0	22	1.5	3.0	1.0	38	1.5	3.0	1.0
7	1.5	3.0	1.0	23	1.5	3.0	1.0	39	1.5	3.0	1.0
8	1.5	3.0	1.0	24	1.5	3.0	1.0	40	1.5	3.0	1.0
9	1.5	3.0	1.0	25	1.5	3.0	1.0	41	1.5	3.0	1.0
10	1.5	3.0	1.0	26	1.5	3.0	1.0	42	1.5	3.0	1.0
11	1.5	3.0	1.0	27	1.5	3.0	1.0	43	1.5	3.0	1.0
12	1.5	3.0	1.0	28	1.5	3.0	1.0	44	1.5	3.0	1.0
13	1.5	3.0	1.0	29	1.5	3.0	1.0				
14	1.5	3.0	1.0	30	1.5	3.0	1.0				
15	1.5	3.0	1.0	31	1.5	3.0	1.0				
16	1.5	3.0	1.0	32	1.5	3.0	1.0				

F1: Edit      F3:      F5: Load File    F7: Next Rack    F9:  
 F2: Set All    F4:      F6: Save File    F8: Go to Rack   F10: Main Menu

Figure 5 - Attack/release screen

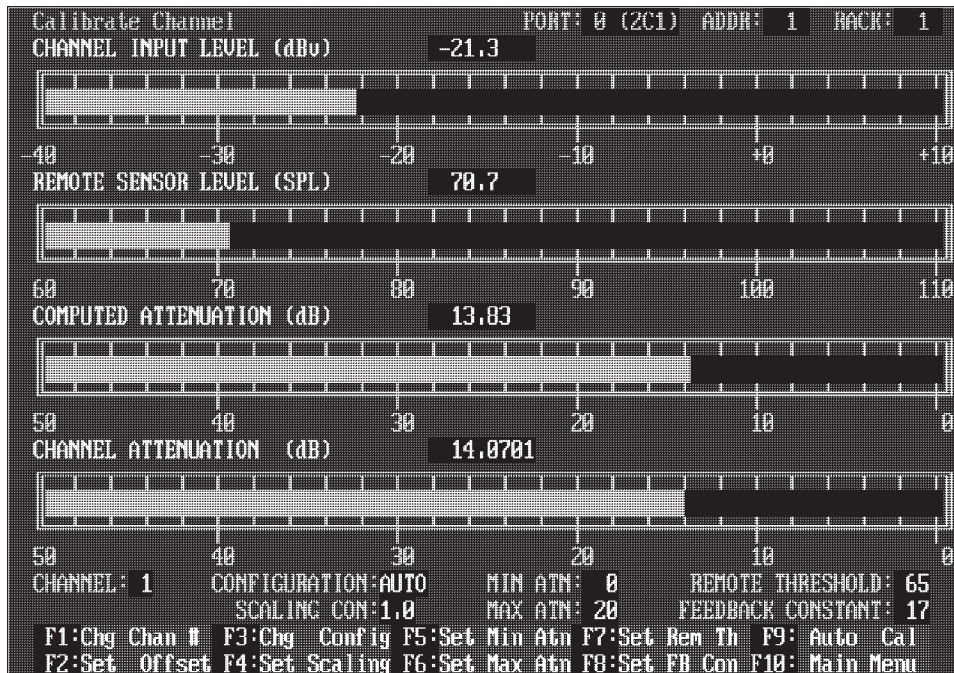


Figure 6 - Calibrate channel screen



Find Rack Address      PORT: 0 (2C1)    ADDR: 1    RACK: 1

Rack Addresses

0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246
7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253
14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254
15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

F1: Find One    F3: Chg Port    F5: Set Address    F7: Next Rack    F9: Total Racks  
 F2: Find All    F4: Chg Address    F6: Flash Busy    F8: Go to Rack    F10: Main Menu

Figure 7 - Find address screen

IED 540 Ambient Analysis System - V1.6    PORT: 0 (2C1)    ADDR: 1    RACK: 1

CH	INP	REM	CREM	ATTN	CH	INP	REM	CREM	ATTN	CH	INP	REM	CREM	ATTN
1	-56	62	62	5.0	17	-56	50	50	0.0	33	-56	50	50	0.0
2	-56	62	62	5.0	18	-56	50	50	0.0	34	-56	50	50	0.0
3	-56	62	50	0.0	19	-56	50	50	0.0	35	-56	50	50	0.0
4	-56	62	50	0.0	20	-56	50	50	0.0	36	-56	50	50	0.0
5	-56	61	62	0.0	21	-56	50	50	0.0	37	-56	50	50	0.0
6	-56	62	61	0.0	22	-56	50	50	0.0	38	-56	50	50	0.0
7	-56	62	50	0.0	23	-56	50	50	0.0	39	-56	50	50	0.0
8	-56	62	50	0.0	24	-56	50	50	0.0	40	-56	50	50	0.0
9	-56	62	50	0.0	25	-56	50	50	0.0	41	-56	50	50	0.0
10	-56	62	50	0.0	26	-56	50	50	0.0	42	-56	50	50	0.0
11	-56	62	50	0.0	27	-56	50	50	0.0	43	-56	50	50	0.0
12	-56	62	62	0.0	28	-56	50	50	0.0	44	-56	50	50	0.0
13	-44	62	50	0.0	29	-56	50	50	0.0			LINK	OK	
14	-44	62	50	0.0	30	-56	50	50	0.0			+30v	OK	
15	-44	62	50	0.0	31	-56	50	50	0.0			+15v	OK	
16	-44	62	50	0.0	32	-56	50	50	0.0			-15v	OK	

F1: Set Attn    F3: Atck/Rel    F5: Find Addr    F7: Next Rack    F9: Emergency  
 F2: Configure    F4: Calibrate    F6:                F8: Go to Rack    F10: Exit

Figure 8 - Main screen

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